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ABSTRACT

This document is designed to assist schools in planning, coordinating, implementing, and evaluating mathematics programs. Eighteen elements are listed which are viewed to be basic to an effective program. The elements are grouped into evaluation areas that focus on administrative coordination, the mathematics teacher, instruction, the curriculum and instructional materials, staff development, physical facilities and equipment, and community involvement. The elements are listed with related questions and a rating scale that may be used to study existing programs. All elements are considered to be attainable, and attainment of all 18 is seen to indicate a successful mathematics program. Two sample forms, called the school-level mathematics target form and the school-level target monitoring form, are provided. These are designed to record and monitor progress towards identified targets by utilizing the integral elements and related questions that make up the bulk of this publication. (MP)

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INTEGRAL ELEMENTS OF AN EFFECTIVE MATHEMATICS PROGRAM

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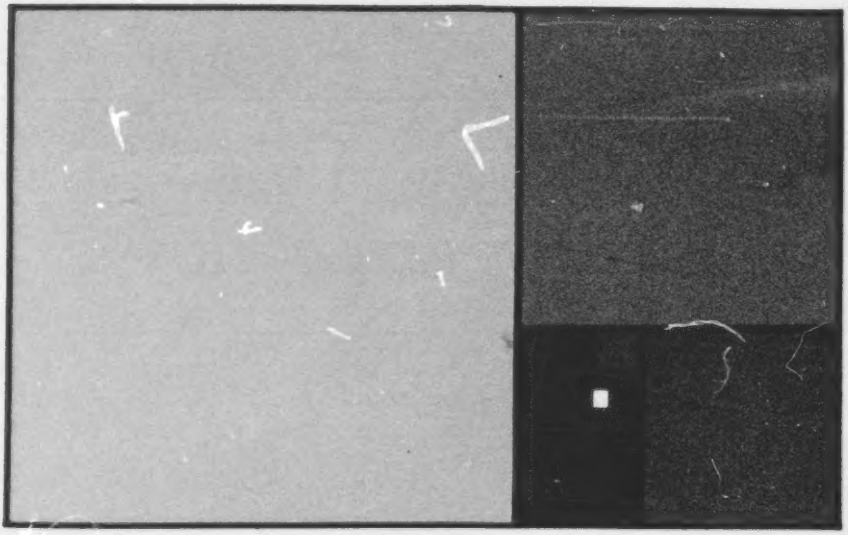

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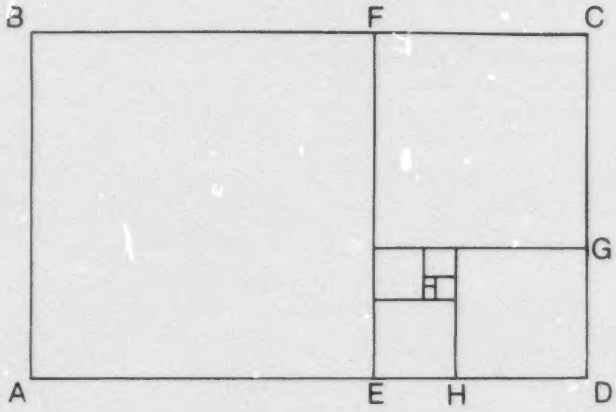

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Integral Elements Of An Effective Mathematics Program

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Foreword

This publication, *Integral Elements of an Effective Mathematics Program*, is designed to assist schools in planning, coordinating, implementing, and evaluating mathematics programs. It gives guidelines for administration, instruction, curriculum materials, staff development, physical facilities and equipment, and community involvement in providing for a mathematics program that will meet the needs of all students.

Each section includes one or more elements with related questions that may be used to study existing programs. A rating scale is provided.

We hope this publication will provide assistance in giving school administrators and instructional personnel information they will need for improving mathematics instruction for students.

Alton O. Bowen
Commissioner of Education

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Introduction

In general, periodic review of any educational program is necessary to maintain quality. Specifically, the need to provide young people with the basic skills necessary to function effectively makes careful review of mathematics programs in Texas schools imperative.

Test scores are often used to measure success. These scores may or may not reflect the real success of a mathematics program. For example, a school with mathematically talented students may report high test scores yet the program may fall short of meeting these students' needs.

This publication has been developed to serve as a guide for the evaluation of a school's mathematics program. The 18 elements listed are basic to an effective program. They provide a means by which strengths and needs of present programs are clearly indicated. All elements are attainable. Therefore, attainment of all 18 will indicate a successful mathematics program.

No attempt has been made to define "attained." The decision of whether the element is attained or not attained must be based on careful and thoughtful discussion, including documentation wherever possible, by all members of the school staff associated with mathematics instruction.

Appropriate questions, sufficiently specific and direct to promote reflection and discussion, follow the statement of each element. The rating scale—E A I N—is to be used only as a record of the staff's response to each question. (E = excellent, A = adequate, I = inadequate, N = not applicable.)

Each school should strive for a rating of *excellent* for each question, even though such ratings cannot always be attained because of constraints over which the school has little or no control. Cooperative planning is needed for improving each area where the rating is *adequate* or *inadequate*.

Integral Elements
Of An Effective Mathematics Program

ADMINISTRATIVE COORDINATION

An effective mathematics program requires professional administrative support. Administrators should be knowledgeable of the program and provide educational leadership.

1. There is administrative coordination of the mathematics program.		**Attained**	**Not Attained**
	1.1 Is there a designated person responsible for the coordination of the program throughout the school district?	Yes	No
	1.2 Is there a mathematics resource person assigned to each building staff?	Yes	No
	1.3 Is there adequate time scheduled daily for mathematics instruction?	Yes	No
	1.4 Is at least half of the instructional time devoted to concept development?	Yes	No

THE TEACHER OF MATHEMATICS

The teacher of mathematics is the most important component of any mathematics program. The teacher must have knowledge of mathematics, utilize a variety of teaching styles and materials, and design appropriate strategies to facilitate the mathematics education of students. Moreover, the teacher of mathematics must exhibit positive attitudes toward mathematics, show respect for learners, exhibit enthusiasm for teaching, and have a realistic opinion of his or her own competencies.

2. A qualified teacher of mathematics is assigned to teach each mathematics class.		**Attained**	**Not Attained**
	2.1 To what extent are elementary teachers prepared in mathematics education?	E A I N	

Rating Scale: E = excellent, A = adequate, I = inadequate, N = not applicable

2.2 To what extent are elementary mathematics classes taught by teachers with an academic specialization in mathematics? (18 hours) E A I N

2.3 To what extent are secondary mathematics classes taught by teachers with mathematics specialization certification? (24 hours) E A I N

2.4 To what extent are teachers of mathematics participating in mathematics workshops, meetings, institutes and conferences, and college level programs? E A I N

2.5 To what extent are teachers of mathematics encouraged to observe other mathematics classes? E A I N

2.6 To what extent are summaries of relevant current research made available to teachers of mathematics? E A I N

2.7 To what extent do teachers of mathematics participate in the activities of professional mathematics organizations? E A I N

2.8 To what extent do teachers of mathematics read and use publications and materials from professional mathematics organizations? E A I N

2.9 To what extent does each teacher of mathematics plan and implement a program for self-improvement? E A I N

INSTRUCTION

The instructional program should be designed to achieve specified goals and objectives with teaching activities provided that are based on appropriate assessment of student needs.

		Attained	Not Attained
3.	**Student attainment of clearly defined objectives is a primary goal of the instructional program.**		
3.1	To what extent are objectives developed at the local level available to the teacher?	E A	I N
3.2	To what extent is actual class instruction based on objectives?	E A	I N
3.3	To what extent are assessment items appropriate for measuring the student attainment of the objectives?	E A	I N
3.4	What is the level of student awareness of the objectives of each lesson?	E A	I N
3.5	To what extent do students assume responsibility for the attainment of the objectives?	E A	I N
4.	**Assessment devices are administered by the teacher and data obtained are utilized in planning instructional activities for individual students.**	**Attained**	**Not Attained**
4.1	To what extent are teachers aware of informal diagnostic activities and conferences as a means for assessing student attainment?	E A	I N
4.2	What is the availability of appropriate diagnostic measures and tools?	E A	I N
4.3	To what extent are teachers assisted in interpreting results of and in utilizing a variety of assessment measures?	E A	I N
4.4	To what extent do teachers use diagnostic techniques for prescribing appropriate instructional activities for individual students?	E A	I N

		Attained	Not Attained
5.	**Instructional activities for students are based on their needs, interests, and abilities.**		
5.1	To what extent are the activities based on students' previous mathematical experiences?	E A	I N
5.2	How well are instructional activities planned to lead students from the concrete to the abstract?	E A	I N
5.3	To what extent do instructional activities regularly include problem solving involving mathematical applications meaningful to students?	E A	I N
5.4	To what extent are available manipulative materials used by students in learning activities?	E A	I N
5.5	To what extent is appropriate mathematics instruction provided for each student on a daily basis?	E A	I N
6.	**Teaching strategies are matched to the needs of the students and the nature of the objectives.**	**Attained**	**Not Attained**
6.1	To what extent do teaching practices include large-group, small-group, and/or individualized instruction as appropriate to each lesson?	E A	I N
6.2	To what extent are students appropriately involved in a variety of activities and instructional methods?	E A	I N
6.3	To what extent is the pacing of each lesson matched with the students and the content?	E A	I N
6.4	To what extent do teachers employ teaching styles compatible with students' learning styles?	E A	I N

		Attained	Not Attained
7.	**The classroom environment is conducive to the learning of mathematics.**		
7.1	To what extent does the teacher create a positive learning environment?	E A I	N
7.2	To what extent does the teacher use the physical environment to complement instruction?	E A I	N
8.	**Each teacher maintains and interprets appropriate records of student progress.**	**Attained**	**Not Attained**
8.1	To what extent does each teacher use an acceptable method for recording student progress?	E A I	N
8.2	To what extent do teachers of mathematics provide consistent evaluation and interpretation of student progress?	E A I	N
8.3	How effective is the communication of student progress to students and parents?	E A I	N
9.	**Instructional leadership and support are provided for teachers of mathematics.**	**Attained**	**Not Attained**
9.1	To what extent does the principal provide instructional leadership and support for the mathematics program?	E A I	N
9.2	To what extent do teachers of mathematics and counselors communicate in advising students on program decisions?	E A I	N
9.3	To what extent are volunteers and paraprofessionals used to assist with the implementation of the mathematics program?	E A I	N
9.4	To what extent are teachers consulted in planning instructional schedules?	E A I	N

9.5 To what degree has provision been made for sharing among teachers; i.e., meetings for discussion of teaching concerns and techniques, conferences on the needs of individual students, program planning, and interdisciplinary planning? E A I N

THE CURRICULUM AND INSTRUCTIONAL MATERIALS

The mathematics program content includes problem solving; using mathematics in everyday situations; estimation and approximation; appropriate computational skills; geometry; measurement; the study of tables, graphs, and charts; the use of mathematics for prediction; and instruction for computer literacy.

10. Appropriate mathematics curriculum and materials are provided for each student. **Attained** **Not Attained**

10.1 To what extent are provisions made for all students? E A I N

10.2 To what extent are provisions made for gifted and talented students? E A I N

10.3 To what extent are provisions made for remedial instruction where needed? E A I N

10.4 To what extent are provisions made for handicapped students? E A I N

10.5 To what extent are provisions made for disadvantaged students to qualify under Title I, Elementary and Secondary Education Act? E A I N

10.6 To what extent are special services available to teachers of mathematics (such as referral services, resource teachers, consultants)? E A I N

11. The mathematics program in each school is consistent with state and local goals and objectives. **Attained** **Not Attained**

11.1 To what extent are there system-approved curriculum guides available for each mathematics teacher in the school? E A I N

11.2 To what extent are there approved mathematics course guides available for each course offered within the school? E A I N

11.3 To what extent are the guides current and consistent with state and local goals and objectives? E A I N

11.4 To what extent are the local curriculum guides understood and followed? E A I N

12. An established procedure exists for evaluating school mathematics programs. Attained / Not Attained

12.1 To what extent have procedures been established to evaluate the effectiveness of the mathematics program? E A I N

12.2 To what extent are these procedures periodically applied? E A I N

12.3 To what extent are the evaluative results used to modify the mathematics program. E A I N

13. The content of the materials (including textbooks) selected to support the program is consistent with the objectives of the mathematics program and students' needs. Attained / Not Attained

13.1 To what extent is the content mathematically sound? E A I N

13.2 To what extent is the level of the content appropriate for the identified group? E A I N

13.3 To what extent are there meaningful applications within the mathematics program content? E A I N

14. An established procedure exists for the evaluation and selection of mathematics instructional materials within the school. Attained / Not Attained

14.1 To what extent have procedures been established to evaluate textbooks and other printed material in accordance with state guidelines? E A I N

14.2 To what extent have procedures been established to evaluate textbooks and other printed material in accordance with local guidelines? E A I N

14.3 To what extent are established procedures used to evaluate and select supplementary instructional materials? E A I N

14.4 To what extent are provisions made for teachers to participate in the evaluation of materials? E A I N

14.5 To what extent are provisions made for teachers to become familiar with the selected materials before using them with their students? E A I N

14.6 To what extent does the staff work with the media specialists in selecting materials in mathematics for classroom use? E A I N

STAFF DEVELOPMENT

15 **There is a continuous program of staff development.**	**Attained**	**Not Attained**
15.1 To what extent are needs of personnel identified?	E A I	N
15.2 To what extent are staff development activities related directly to the school's mathematics curriculum?	E A I	N
15.3 To what extent do staff development leaders have appropriate expertise?	E A I	N
15.4 To what extent is provision made for personnel to attend local, state, and national professional meetings in mathematics?	E A I	N
15.5 To what extent has there been a survey (within the past year) of the needs of the staff in the area of mathematics education?	E A I	N

PHYSICAL FACILITIES AND EQUIPMENT

The learning of mathematics should move from the concrete to the abstract with the use of models. The setting allows for participation in activities involving the use of measuring instruments, manipulatives, calculators, and computers for the purpose of solving problems that are real-world applications.

	Attained	Not Attained
16. The facility allows for sufficient instructional space for the mathematics program.		
16.1 To what extent are instructional areas provided for large-group, small-group, and individualized instruction?	E A I	N
16.2 How well are students with special physical and/or instructional needs provided for within the facility?	E A I	N
16.3 To what extent are mathematics resource areas available and convenient within the facility for both students and teachers?	E A I	N
16.4 If a mathematics, laboratory exists within the school, to what extent does it allow for a variety of activities?	E A I	N
16.5 To what extent do the staff areas allow for both individual and group planning and preparation?	E A I	N
17. Equipment is provided for the mathematics program.	**Attained**	**Not Attained**
17.1 To what extent is sufficient equipment provided to support the mathematics program; i.e., bulletin boards, calculators, overhead projectors, computers, mathematical models, and measurement instruments?	E A I	N
17.2 To what extent is appropriate equipment provided for students with special physical and/or instructional needs in mathematics?	E A I	N

17.3 To what extent do equipment storage areas exist that are sufficient, accessible, and secure? E A I N

17.4 To what extent are provisions made for the installation and use of computers, instructional television, and electrical outlets when appropriate? E A I N

COMMUNITY INVOLVEMENT

Community support includes financial and human resources. Consideration of the use of mathematics in the community should be a part of the planning of a mathematics program.

18. There is a plan for informing the community about the school's mathematics program as evidenced by such activities as those mentioned below.	**Attained**	**Not Attained**
18.1 To what extent are news releases submitted to local news media?	E A	I N
18.2 To what extent are brochures or other publications developed explaining the program's goals and objectives?	E A	I N
18.3 To what extent are teacher-parent conferences held?	E A	I N
18.4 To what extent are presentations made to the parent-teacher organizations and other local groups?	E A	I N

Sample Forms

By utilizing the integral elements and related questions presented in this publication, target areas for program inprovement in mathematics can be identified. The mathematics staff should cooperatively set oriorities in the target areas.

The following are forms that may be used to record and monitor progress toward a target. The forms involve hypothetical examples. Use of the forms for assessing the mathematics program is strictly an option of the local school.

SCHOOL-LEVEL MATHEMATICS TARGET FORM

Based on a careful analysis of the *Integral Elements of An Effective Mathematics Program*, the staff at _____ School has formulated the following school mathematics targets for the 19___-19___ school year.

Target #1— By the end of the _____ school year, each mathematics teacher will have developed a plan for self-improvement.

Target #2— By September 30, 19___, instructional leadership and support will be provided for teachers of mathematics.

Teachers: _____

_____

_____

Principal: _____

Date: _____

SCHOOL-LEVEL TARGET MONITORING FORM

By September 30, 19____, instructional leadership and support will be provided for teachers of mathematics.

_____

_____—Month Progress Check

Little or No Progress	Some Progress	Good Progress	Target Attained

_____

Comments:

_____

_____—Month Progress Check

Little or No Progress	Some Progress	Good Progress	Target Attained

_____

Comments:

Teachers: _____

_____

_____

Principal: _____

COMPLIANCE STATEMENT

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Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;
(2) operation of school bus routes or runs on a non-segregated basis;
(3) nondiscrimination in extracurricular activities and the use of school facilities;
(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;
(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;
(6) nondiscriminatory practices relating to the use of a student's first language, and
(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 11375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

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